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ABSTRACT

It is pointed out that education should be geared to the individual student; yet implementation of individualized programs has been slow. A set step in the area of individualized instruction should be the development of an appropriate methodology for recording and analyzing a student's performance. This paper is an attempt to provide the recording procedures which will aid in achieving such a measure. Under the proposed methodology, a precise measure of a student's performance is obtained by isolating the three components in a performance movement: response emitted by the student, the question, and the interval between the termination of the question and the initiation of the response. Five college psychology students were used in the experiment. A control reader was used to present the reading material to the subjects. The reader controls the speed at which the reading is presented to the subject. Subjects were told to answer 10 questions that would be presented to them via flash cards immediately after reading the selection for that session. Subjects were instructed to read the questions aloud. A cumulative record of the performance of the subjects is presented. Changes in the duration of the components show a definite pattern of variation. On the stimulus duration component there is consistently a reduction in duration from the first to the second session. The number of correct responses increase for all subjects on the second session. The results of the experiment indicate that the recording model advocated has the necessary precision to reflect the most minute changes due to experimental manipulations. (CK)

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A TIME-BASED METHODOLOGY FOR ASSESSMENT OF INDIVIDUAL PERFORMANCE

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Most educators concede that education should be geared to the individual student. The implementation of individualized programs, however, has been slow. Programs are still directed towards the mythical average student.

Some research has been conducted in recent years in an attempt to individualize instruction at the college level (Fester, 1968; McMichael and Corey, 1969; Sheppard and MacDermott, 1970; Johnston and Pennypacker, 1971; Alba and Pennypacker, 1972). The research efforts have produced useful results. Among the conclusions that can be drawn from such research are that (1) the number of students need not be an impediment for individualized instruction, (2) the principles derived from the analysis of behavior offer substantive results when applied to human learning, and most important, (3) it is feasible to conduct longitudinal studies in which both the experimenter and subject benefit from the experimental procedures. In relation to the last point it should be noted that this type of research more closely approximates the actual learning environment.

A further step in the area of individualized instruction should be the development of an appropriate methodology for recording and analyzing

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a student's performance. The methodology should be instrumental in assessing the effect that selected variables have on student's performance. This paper is an attempt to provide the recording procedures which will aid in achieving such a precise and sensitive measure of performance.

Description of the Model

An instructional procedure is effective if it permits the student to achieve mastery over a given instructional unit (Bloom, 1968). The assessment of mastery requires that one be able to measure the performance of each student in response to a stimulus situation, e.g., a question. Under the proposed methodology a precise measure of a student's performance is obtained by isolating the three components in a performance movement.

The three components can be clearly distinguished within a performance movement. One of the components is the response emitted by the student in answering a question. Another component is the question (stimulus situation) itself. It should be noted that, ideally, one would prefer that the response be controlled directly by the question. The final component of interest is the interval between the termination of the question and the initiation of the response, (i.e., the response latency duration).

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Insert Figure 1 about here

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Each of the three components can be measured accurately on a time scale. The temporal variability of any one of the components or of the total performance movement can be determined precisely. Thus, the measure derived is particularly sensitive to experimental manipulations.

A time measure does not provide a complete assessment of an individual's performance since it ignores the accuracy of the responses. For a more complete analysis, correct and incorrect responses are also recorded.

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Insert Figure 2 about here

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To obtain an overall appraisal the student's performance is represented on a cumulative graph (see Figure 2). Each unit on the ordinate represents a different movement while horizontal displacement represents elapsed time. Incorrect responses are recorded on the ordinate exactly at the point corresponding to the performance movement in which the response occurred.

METHOD

Subjects

Five seniors in psychology, three males and two females enrolled in a behavior principles course at the University of Florida, were used in this experiment. The students were asked to participate in the experiment in lieu of one laboratory project of the two required for successful completion of the course.

Procedures and Materials

A control reader was used to present the reading material to the subjects. The reader controls the speed at which a complete line of reading is presented to the subject. Each reader was enclosed in an independent cubicle.

On their first session the subjects were instructed on the procedures to be followed throughout the experiment. They were told to set the reader at a comfortable speed and to use the same setting and reader in all of their sessions.

The reading units used in the experiment consisted of selected articles from a book of readings (Set MN--Educational Development Laboratories, Huntington, New York, 1963). The book was especially developed for use in reading laboratories at the college level.

The subjects were told that the experiment consisted of an evaluation of reading comprehension. They were also told that immediately after reading the selection for that particular session they were required to answer the ten questions that would be presented to them via flash cards. They were instructed to read the questions aloud.

Ten constructed response questions were generated for each article and typed on individual 3" by 5" index cards. The correct answer to each question could be found by turning over the card, a procedure all subjects followed after answering each question. Upon their return to the laboratory they were asked to read the same selection and answer the questions related to that selection.

A separate room (5' x 6') was used for the question session. The subjects verbal behavior was recorded on tape and later played back to

obtain the desired measures by clocking the duration of the three components with a chronometer.

In regards to the way in which the records were obtained, it should be mentioned that the graphs are blind to any measure below one second. It was impossible to measure any event with a duration of less than one second; therefore, all measures are adjusted accordingly. In future research the precision of the measures will only be limited by the sophistication of the recording mechanism.

RESULTS AND DISCUSSION

A cumulative record of the performance of all five subjects on Unit 9 is shown in Figure 3. There can be no clearer picture of individual differences than those depicted by the records.

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Insert Figure 3 about here

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The results of the experimental procedures can be appreciated at a glance. Level A for all five subjects correspond to their first session for that unit. Level B corresponds to the second session on the same unit for all subjects. Not only had the subjects performed differently on their first session, but the experimental manipulations produced different effects on the performance of each subject. Although there is wide variability in their individual performances some typical trends seem to emerge.

First, changes in the duration of the components show a definite pattern of variation. On the stimulus duration component there is consistently a reduction in duration from the first to the second session.

The same reduction in duration can be observed for the response latency component, but in this case the differences between sessions is more acute. The stability of the response duration is due more to shortcomings in the measurement apparatus than to any intrinsic property of that component.

Second, the number of correct responses also show a definite direction of change as a result of the procedures. For all subjects the number of correct responses increases on the second session.

The results of the experiment indicate that the recording model advocated has the necessary precision to reflect the most minute changes due to experimental manipulations. Furthermore, the sources of such variability can be pinpointed accurately through a local analysis of each movement or any one of its components. This local analysis done on each individual item can certainly help some areas in education where the evaluation of the instructional material is of primary concern. Specifically, the fields of programmed instruction and computer-assisted instruction could profit directly from an implementation of the recording procedures.

Of utmost importance in terms of designing truly individualized instructional procedures is the fact that by directing attention to the local fluctuations shown on the records, the interaction between subject and material can be clearly scrutinized. Thus, educators will be afforded an opportunity to evaluate student's performance with a high degree of precision while at the same time they will be able to provide empirically sound corrective procedures on an individual basis.

The methodology will allow for a precise and continuous assessment of the effect that instructional procedures have on student's performance.

The value of such assessment should not be underestimated. The variables which have a direct effect on the student's performance can be isolated and studied with the scientific precision demanded by the phenomena of human learning. Further, such assessment can be undertaken within the structure of ongoing classes without detriment to the subjects. An extensive field of research is open to teachers at all levels.

Two aspects of individual performance currently enjoying widespread interest are those of the assessment of learning styles and rate of learning. The recording procedures advocated in this paper will certainly facilitate the study of those individual characteristics. Indeed, the limits of the recording procedures are those placed by the imagination of the researchers in the area.

A question may arise as to the generalizability of the findings. It should be noted that the experimental design used in the present research requires replication of the procedures before statements of wide generality are made (Sidman, 1960). This paper is considered as a ground-breaking attempt. More than one researcher is needed to provide a sound foundation in the experimental analysis of human academic learning.

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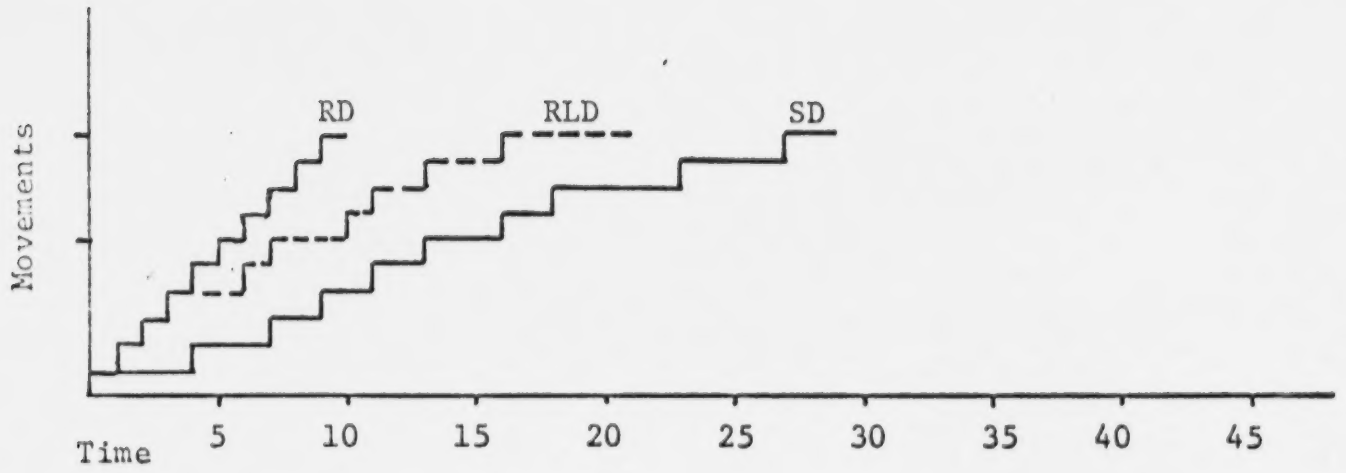
FIGURE 1

Components of the Performance Movement

[A-B]--Stimulus Duration; [B-C]--Response Latency Duration; [C-D]--Response Duration; [A-D]--Performance Movement.

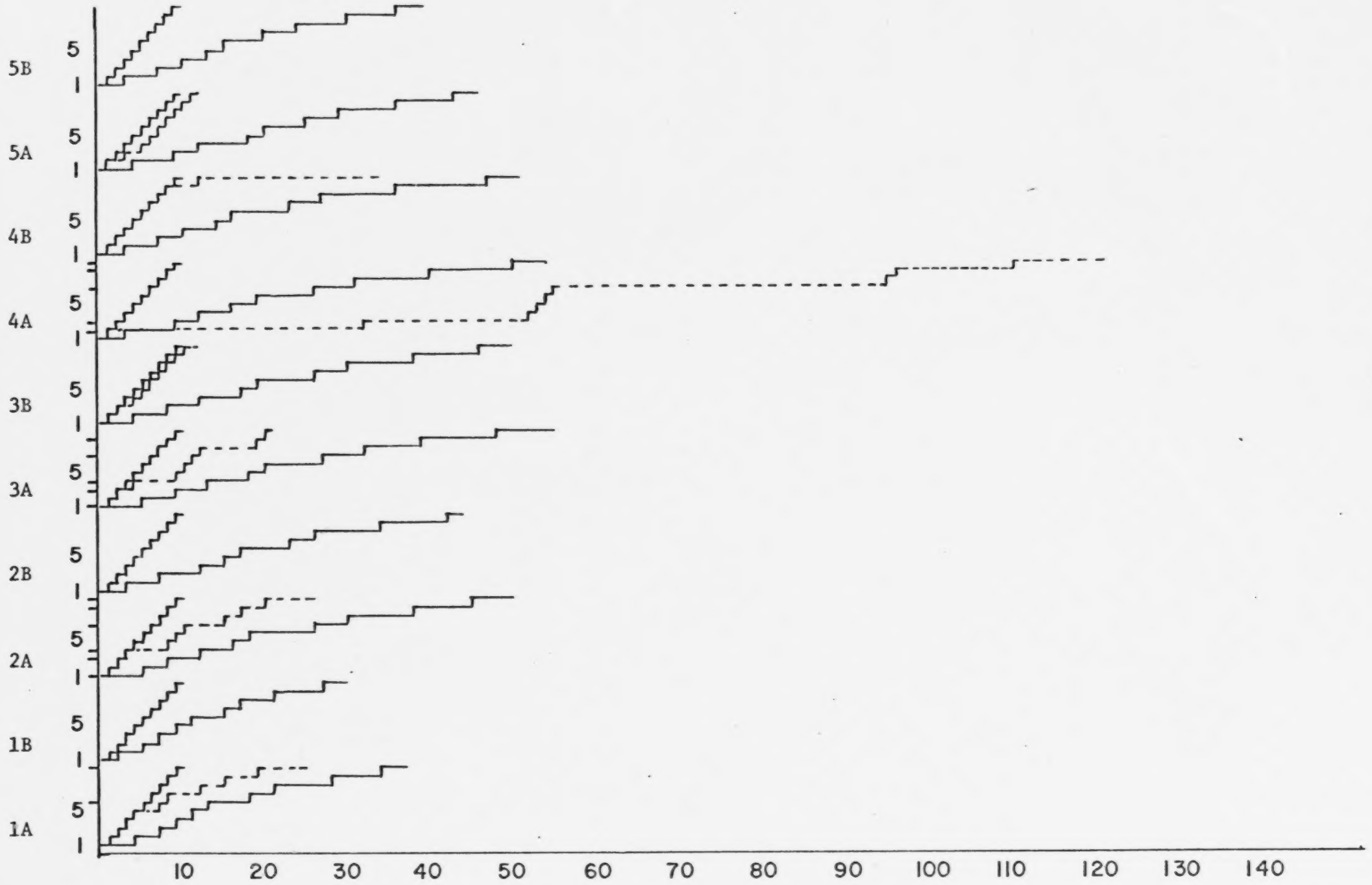
FIGURE 2

Cumulative Graph of Ten Performance Movements



(RD) Response Duration; (RLD) Response Latency Duration;
(SD) Stimulus Duration; (-) Incorrect Responses.

FIGURE 3



Cumulative Record of the Performance of Five Subjects
on Unit 9